

S'ALBUFERA DE MALLORCA: A BOTANICAL VIEW

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Whilst the principal value of S'Albufera is ornithological its botanical importance should not be overlooked. Different criteria are considered to assess its importance including extent, species richness, rarity and potential for education and research. The three main habitats include the marshes, which range from freshwater to saline, open water with a similar gradient, and dunes which include stabilised dunes. The dunes are particularly species rich and many comparable areas have disappeared from many areas around the Mediterranean. S'Albufera needs protection and monitoring, but whilst active management is still being carried out it is not the ideal site to record the ecological effects of global climatic change.

Keywords: evaluation, monitoring, dunes, vegetation, flora.

Aunque el principal valor de S'Albufera sea ornitológico, su relevancia botánica no debe ser descuidada. Se usan diferentes criterios para estimar su importancia incluyendo: extensión, riqueza de especies, presencia de rarezas y potencial educativo y de investigación. Los tres principales hábitats incluyen marismas, cuya agua oscila entre dulce y salina, aguas libres con un gradiente similar y un sistema dunar que incluye dunas estabilizadas. Las dunas son particularmente ricas y muchas áreas similares del litoral mediterráneo han desaparecido. S'Albufera necesita protección y estudios de seguimiento, sin embargo, mientras aún se esté llevando una gestión activa, no es una localidad ideal para registrar los efectos ecológicos del cambio climático global.

Palabras clave: evaluación, seguimiento, dunas, vegetación, flora.

Encara que el principal valor de S'Albufera és ornitològic, la seva importància botànica no ha d'ésser descuidada. S'utilitzen diferents criteris per a estimar la seva valoració: extensió, riquesa específica presència d'espècies rares, potencial educatiu i investigador. Els tres principals hàbitats inclouen aiguamolls de diferent salinitat, aigües lliures amb un gradient similar i un sistema dunar que inclou dunas estabilitzades. Les dunas són particularment riques i moltes àrees comparables han desaparegut en el litoral mediterrani. S'Albufera necessita protecció i anàlisis de seguiment, però, mentre hi hagi encara una gestió activa, no és una localitat ideal per a registrar els efectes ecològics del canvi climàtic global.

Paraules clau: avaluació, seguiment, dunas, vegetació, flora.

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Paisatge de macròfits emergents amb canyet (*Phragmites australis*) i sesquera (*Cladium mariscus*) com espècies predominants; a l'esquerra una part del Canal d'en Moix. (Foto: Joan Mayol)
Emergent macrophyte landscape with *P. australis* and *C. mariscus*, on the left Canal d'en Moix.

S'Albufera has now been internationally recognised as an important wetland saved from development. Credit must go to the individuals who campaigned so hard for its protection and to the Balearic Government for purchasing much of the site and for designating it the first Natural park of the Balearic Islands. It is also a Ramsar site which formalises its international importance as a key world wetland. Wetlands throughout the world are under threat but Mediterranean wetlands are particularly vulnerable due to developments associated with tourism and freshwater abstraction as well as the usual threats from agriculture, urbanisation and industrialisation.

In the case of S'Albufera the principal conservation value of the area has been considered to be ornithological. There is a large population of the moustached warbler which has a fairly narrow geographical range, the area is used as a staging post for migrants travelling between Africa and northern Europe especially Hirundines (swallows and martins), and it supports fair

numbers of characteristic and attractive marsh birds such as purple, grey and night heron, black-winged stilt, little egret and marsh harrier.

Recently the site has also been identified as one of the first in the world for implementing a global monitoring programme. The International Council of Scientific Unions has launched an International Geosphere-Biosphere Programme which aims to identify a series of about 200 global observatories to assess the impacts of global climatic change on ecosystems. S'Albufera was considered an ideal site because of its high ecological importance and interest. It was also assumed that local changes due to management would be small and less than changes due to global climatic effects but this is discussed in more detail below. In 1989 Earthwatch and staff and students from the Conservation Course from University College London started collecting baseline data (Conservation Course 1989).

It was also effectively protected, had good documentary information about flora,



Paisatge a Ses Punes, a la vora de les dunes interiors.
Landscape at Ses Punes, near the inner sand dunes.
(Foto: Joan Mayol)

fauna, history and management, its large size and sensitivity to global change.

Whilst the ornithological value of S'Albufera is widely recognised its botanical importance appears to me to be frequently overlooked and I shall take the opportunity to discuss some aspects of it here. This is not to suggest that there are not other important values of the area such as for butterflies, dragonflies, possibly other groups of invertebrates, as well as for its landscape quality and industrial archaeology. My expertise is mostly botanical although I must confess to my own limitations because I am not from Mallorca but I have however worked on wetlands in North Africa, Greece and northern Europe so I can try to place S'Albufera in some kind of geographical and ecological context.

Before preparing an evaluation one needs to consider the criteria that will be used. Currently there are about ten which are used by professional conservationists (GOLDSMITH 1983, 1990). However there is some debate about which ones are appropriate and their relative importance. One's position in this debate depends on the

objective of the evaluation. Mine is to try to convince local people of the value of this particular site, especially decision-makers and especially with regard to the flora. Different criteria and hence different management recommendations would be made for the use of S'Albufera as a global monitoring station compared with the use of the site if the principal objective was to demonstrate to visitors the maximum variety of species.

THE CRITERIA THAT I HAVE USED ARE AS FOLLOWS:

Size. The implication here is the bigger the better and S'Albufera is the largest example of wetland habitat in the Balearics. At 1700 ha. we are considering a very extensive wetland with opportunities to safeguard a wide variety of marsh and dune habitats and their characteristic species. However some habitats may be considered sufficiently extensive, such as *Phragmites* reedbed, and others may be very restricted in extent, e.g. open fresh water.

Species richness. Most conservationists believe that the more species an area contains the better, although we must recognise that some habitats are usually species poor. Also the species should be characteristic of that habitat type because disturbance sometimes results in the introduction of large numbers of weed species which are not considered to be a conservation gain. Each of the main habitats at S'Albufera has a different number of flowering plant species and we do not know precisely how many occur in each habitat type. Conservationists are currently placing considerable emphasis on "biodiversity" which may be viewed as the same as species richness or it may be seen as including additional, enhanced value based on the totality of the components. Habitat diversity is a related concept but is difficult to assess if we are unclear as to how the various habitats are defined, for example, are the marshes a single habitat or do they consist of freshwater and saline marshes, i.e. two habitats, or is there an intermediate brackish marsh type in which case there are three marsh types? For this and other reasons I consider it preferable to avoid habitat diversity as a criterion.

Rarities. Conservationists place great emphasis on the number of rarities on a site, although it can be difficult to define rarity. I think that most people would agree that Mallorcan endemics, i.e. those species which occur nowhere else but the Balearics are important. Naturalists enjoy encountering the unexpected and this may be why conservationists place high value on rarities and high species richness.

Conspicuousness. This is not really a standard conservation criterion but I have chosen it for this particular site because of its location on an island with a flourishing tourist industry. Tourists are important to the economy of Mallorca and many visitors enjoy the experience of lots of colourful flowers especially out of season. Many of the plants of the dunes, stabilised dunes and tracks of S'Albufera are extremely attractive and this seems to me to add to the value of the reserve.

Educational and research potential. The team of the Parc of S'Albufera have

declared that they will try to arrange for every child on the island to visit S'Albufera during every child's school career. This seems to be an excellent objective. Some banks such as "La Caixa" have also produced an educational pack about the reserve which will help disseminate information. The University of the Balearics has embarked on detailed research of the wetland. All these activities will be encouraged and assisted by the criteria of species richness and size indicated above as well as others such as conspicuousness and equitability of species distribution. Plants are particularly well suited to educational purposes as they do not move around and are not frightened away by enthusiastic children.

These criteria are not exclusive and are rather subjective but they will help us consider each of the main habitat types at S'Albufera.

The Marshes. This is the most extensive habitat and the dominant plants are *Phragmites australis* and *Cladium mariscus* (nomenclature follows Flora Europaea as also used by BECKETT, 1988). The former is the matrix in which several characteristic wetland bird species exist. The latter is more local and is an indicator of base-rich fresh water. If sea-level were to rise or the regime for managing the sluices were to change this is one species whose distribution could change markedly. Its English name of saw-sedge is most apt and its distribution across the reserve is a good indicator of the routes of fresh water from sources such as springs to the sluices that lead to the sea. It is therefore a useful indicator. Other species at the freshwater end of the marsh gradient include *Typha* spp., *Alisma plantago-aquatica* and *Sparganium erectum*.

The marshes show an interesting gradient from the freshest areas in the west and south to the saline areas in the north-east. These have high proportions of *Arthrocnemum glaucum*, *Salicornia fruticosa*, *Inula crithmoides*, *Halimione portulacoides*, *Aster tripolium*, and *Scirpus maritimus*. The proportions of the various components can tell us a lot about the duration of flooding

and the salinity regime. The whole range of this gradient is species poor due to the harsh effects of flooding and salinity but this is a very interesting gradient for study. There are other components which can tell a different story, for example those species characteristic of muddy ground below the general marsh canopy, such as *Apium nodiflorum*, *Iris pseudacorus*, *Cotula coronopifolia*, *Rorippa nasturtium-aquaticum*, *Mentha suaveolens*, *Callitriche stagnalis*, *Epilobium hirsutum* and *Ranunculus* species. Other important plants are intermediate between the two extremes identified above. These include *Juncus maritimus*, *J. subulatus*, *Schoenus nigricans*, and *Pulicaria dysenterica*. The total number of species that I recorded in 31 quadrants each 20 x 20 metres in two weeks sampling was 44.

Orchis laxiflora (= *O. palustris*) has to be considered here as it is probably the most famous plant of S'Albufera and some people consider subspecies *palustris* to be a Mallorquin endemic. It occurs along the marsh-track edges where it escapes dense shade and burning. Earthwatch volunteers recorded 266 inflorescences in 1990 and one plant reached 1.05 metres in height.

Arundo donax is a very tall reed with perennial shoots which also occurs along the marsh-track and marsh-canal edges. It may have been introduced as a source of higher fibre yields by the paper company. Further investigation of its history and ecology would probably be rewarding.

The dunes. This area is botanically very rich and two weeks study of that part of the dune system in the Park plus detailed analysis of two transects each 360 metres and at right angles to the coast resulted in a species list of 116 species. It is not unreasonable to suggest that the botanical richness of the dunes is about threefold that of the marshes. It is probably the most threatened habitat on Mallorca due to the fine sandy beaches that are associated with dunes, or vice versa. The dominant plant is *Pinus halepensis*, occurring as a naturally regenerated population, periodically burnt and abused in various other ways. The associated other species include a large number of codominants including *Pistacia*

lentiscus, *Rosmarinus officinalis*, *Erica multiflora*, *Phillyrea angustifolia*, *Cistus salvifolius*, *Smilax aspera*, *Asparagus acutifolius*, *Halimium halimifolium* and the grass *Brachypodium retusum*. Less abundant species include *Chamaerops humilis* (the only European palm), *Thymelaea myrtifolia* (= *T. velutina*) which is a Balearic endemic, *Clematis flammula*, *Lonicera implexa*, *Ruscus aculeatus*, *Dorycnium pentaphyllum*, *D. hirsutum*, *Teucrium polium*, *Fumana thymifolia*, *Psoralea bituminosa*, *Daphne gnidium*, *Myrtus communis* and *Osyris alba*. *Gladiolus illyricus* also occurs and adds to the attractiveness of the dunes. This habitat also contains several orchid species including *Ophrys speculum*, *O. apifera*, *O. bombylifera*, *O. coriophora*, and *Serapias parviflora* (see too MARTÍNEZ TABERNER 1983).

The stabilised or fossil dunes are a similar area that has a distinct but related flora. It is also very rich and has some very attractive components including *Muscari comosum*, *Ornithogallum umbellatum*, *Asphodelus aestivus*, *Gladiolus illyricus*, as well as several *Papaver* and orchid species. Mallorquins may be familiar with these but for north Europeans they are a delightful sight. This area is currently being grazed very intensively and some areas ploughed up and sown with cereals. This may be acceptable management for conservation purposes but for a site used for monitoring global change it is unfortunate.

The edge of the dunes adjacent to the sea is particularly important and contains *Juniperus oxycedrus* subsp. *macrocarpus* often as the dominant plant, the sea daffodil, *Pancratium maritimum*, *Mattiola sinuata*, *Eryngium maritimum*, *Cakile maritima*, *Limonium* sp., *Lotus cytisoides*, *Helichrysum stoechas*, *Crucianella maritima* as well as *Ammophila arenaria* (which is not abundant in this dune system) *Elymus farctus* (formerly *Agropyron junceiforme*) and *Sporobolus arenarius*. It is unfortunate that one of the most interesting species assemblages occurs in the area that suffers the greatest pressures from visitors.

Another interesting habitat within the dune vegetation are the depressions or moist areas. *Schoenus nigricans* and *Plantago*



Orchis laxiflora ssp. *palustris* (Ses Punes)
(Foto: A. Martínez)

crassifolia are probably the best two indicator species. *Phragmites australis*, *Pulicaria dysenterica* and *Sonchus maritimus* are sometimes also present. These areas would repay further study as they are likely to be important to other taxa such as Amphibia and Invertebrates. Only a small part of the total dune system is located within the reserve and this does not include any substantial moist areas.

Open water. This habitat consists of lagoons and canals which vary in their salinity with the aquatic macrophyte species reflecting the salinity of the water. *Potamogeton pectinatus* is abundant and tolerates some salinity. *Potamogeton crispus*, *Riccia* and *Myriophyllum spicatum* are found in freshwater. *Nitellopsis obtusa*, *Zannichellia pedunculata* and *Ceratophyllum submersum* were first records for Majorca when they were found at S'Albufera by Dr. Antoni Martínez. Other species include *Ruppia cirrhosa*, *Lamprothamnium papulosum* and *Ceratophyllum demersum*. The species list is necessarily short but this is an uncommon

habitat on Mallorca, is threatened by water abstraction and needs vigilant protection.

OVERVIEW

The account above demonstrates that S'Albufera is rich in plant species, contains rarities and endemics as well as many attractive flowers and justifies rigorous protection. It is also needed as an international global monitoring station. However one requirement for such monitoring is that locally induced changes should be small and less than any changes due to climatic trends. However current management at S'Albufera is changing in a fairly dramatic way. Water levels in some areas in 1990 were 15-20 cm. higher than in 1989 and salinities were appreciably lower. Thus *Phragmites australis* appears to be increasing on formerly saline areas near the main entrance. A new lagoon has been formed and grazing animals (cattle and horses) introduced. These are all making monitoring of ecological responses to climatic

change very difficult, if not impossible. More proposals are currently being considered including the introduction of water buffalo to control the luxuriance of the aquatic and marsh vegetation. These measures will probably be beneficial to certain groups of birds but they will make S'Albufera less suitable for research on the requirements of different plant species and for monitoring. The reserve is far from pristine and currently reflects past management which was often of a drastic commercial nature but we can only begin to understand how it is functioning and how it should be managed in the future if a few years are allowed for the recording of base-line data and for understanding the requirements of key species.

So we can celebrate that S'Albufera has been saved but we must be cautious about the future. It is important to ensure that "naturalness" plays a major role in this new Natural Park and that it is not manipulated so heavily that it ceases to have a value as a global monitoring station.

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